The Role of Behavioral Science Theory in Development and Implementation of Public Health Interventions

Karen Glanz[1] and Donald B. Bishop[2]

[1]Schools of Medicine and Nursing, University of Pennsylvania, Philadelphia, Pennsylvania 19104; email: kglanz@upenn.edu

[2]Minnesota Department of Health, St. Paul, Minnesota 55164; email: Don.Bishop@state.mn.us

Annu. Rev. Public Health 2010. 31:399–418

First published online as a Review in Advance on January 4, 2010

The *Annual Review of Public Health* is online at publhealth.annualreviews.org

This article's doi: 10.1146/annurev.publhealth.012809.103604

0163-7525/10/0421-0399$20.00

Key Words

theoretical frameworks, concepts, health behavior, strategies, ecological perspective

Abstract

Increasing evidence suggests that public health and health-promotion interventions that are based on social and behavioral science theories are more effective than those lacking a theoretical base. This article provides an overview of the state of the science of theory use for designing and conducting health-promotion interventions. Influential contemporary perspectives stress the multiple determinants and multiple levels of determinants of health and health behavior. We describe key types of theory and selected often-used theories and their key concepts, including the health belief model, the transtheoretical model, social cognitive theory, and the ecological model. This summary is followed by a review of the evidence about patterns and effects of theory use in health behavior intervention research. Examples of applied theories in three large public health programs illustrate the feasibility, utility, and challenges of using theory-based interventions. This review concludes by identifying cross-cutting themes and important future directions for bridging the divides between theory, practice, and research.

INTRODUCTION

Interventions: programs and strategies intended to influence health and/or health-related behavior positively

Theory: set of interrelated concepts, definitions, and propositions that explain or predict events or situations by specifying relations among variables

Ecological perspective: view that public health/health-promotion interventions should target individual-, interpersonal-, organizational-, and environmental-level factors

The most prominent contributors to death and disease in the United States and globally are behavioral factors, particularly tobacco use, diet and activity patterns, alcohol consumption, sexual behavior, and avoidable injuries (22, 75). Effective public health programs to help people maintain and improve health, reduce disease risks, and manage illness usually require behavior change at many levels (e.g., individual, organizational, and community). The most successful public health programs and initiatives are based on an understanding of health behaviors and the contexts in which they occur (32, 33, 36, 38, 39). Strategic planning models provide a structured framework for developing and managing public health interventions and improving them through evaluation (11, 45). Health behavior theory can contribute to program planning and evaluation and to advance research to test innovative intervention strategies (24, 39).

Interventions to improve health behavior can be best designed with an understanding of relevant theories of behavior change and the ability to use them skillfully (12, 39). A growing body of evidence suggests that interventions developed with an explicit theoretical foundation or foundations are more effective than those lacking a theoretical base and that some strategies that combine multiple theories and concepts have larger effects (4, 63, 78). The science and art of using health behavior theories reflect an amalgamation of approaches, methods, and strategies from social and health sciences. This broad range of perspectives from health, social, and behavioral sciences are referred to as "behavioral science theory" throughout this article. Influential work draws on the theoretical perspectives, research, and practice tools of such diverse social and behavioral science disciplines as psychology, sociology, social psychology, anthropology, communications, nursing, economics, and marketing. As the research literature grows, it is increasingly important that the evidence base becomes accessible to both researchers and practitioners (112).

This article provides an overview of contemporary behavioral science theory use for development and implementation of public health and health promotion interventions. The first section gives broad context to influential contemporary perspectives on the multiple determinants and multiple levels of determinants of health and health behavior and defines theory and key types of theory. We next describe selected often-used theories and their key concepts and summarize the evidence about the use of theory in health behavior intervention research. Examples of the application of theories in large public health programs illustrate the feasibility, utility, and challenges of using theory-based interventions. Finally, this review identifies cross-cutting themes and important future directions for bridging the divides between theory, practice, and research.

Multiple Determinants and Multiple Levels of Health Behavior

Many social, cultural, and economic factors contribute to the development, maintenance, and change of health behavior patterns (101). No single factor or set of factors adequately accounts for why people eat as they do, smoke or do not smoke, and are active or sedentary. Knowledge, attitudes, reactions to stress, and motivation are important individual determinants of health behavior. Families, social relationships, socioeconomic status, culture, and geography are other important influences. A broad understanding of some of the key factors and models for understanding behaviors and behavior change can provide a foundation for well-informed public health programs, help identify the most influential factors for a particular person or population, and enable program developers to focus on the most salient issues.

Public health and health-promotion interventions are most likely to be effective if they embrace an ecological perspective (71, 100). Interventions should not only be targeted at individuals but should also affect interpersonal, organizational, and environmental factors influencing health behavior. This mindset

is clearly illustrated when one thinks of the context of groups of employees purchasing food and eating during the work day. Employees may bring their food with them from home or buy food from workplace cafeterias and vending machines. Their choices are influenced by personal preferences, habits, nutrition information, availability, cost, and placement, among other things. The process is complex and determined not only by multiple factors but by factors at multiple levels.

Before the 1970s, public health education emphasized a broad view of social determinants of health, and community organization skills were central to training programs (33). During the next two decades, health educators and clinicians focused more on intraindividual factors such as a person's beliefs, knowledge, and skills. Many behavior-change programs for reducing risk factors continue to have these emphases (62, 78, 118). Current views reflect a return to earlier public health roots and suggest that thinking beyond the individual to the social milieu and environment can enhance the chance of successful health promotion (100). Program planners can and should work toward understanding the various levels of influence that affect individuals' and populations' behaviors and health status.

What is Theory, Explanatory Theory, and Change Theories?

A theory presents a systematic way of understanding events, behaviors, and/or situations (36). A theory is a set of interrelated concepts, definitions, and propositions that explain or predict events or situations by specifying relations among variables. The notion of generality, or broad application, is important (32, 33, 38, 39). Thus, theories are, by their nature, abstract and not content- or topic-specific. Even though various theoretical models of health behavior may reflect the same general ideas, each theory employs a unique vocabulary to articulate the specific factors considered to be important. Theories vary in the extent to which they have been conceptually developed and empirically tested; however, testability is an important feature of a theory (109).

Theories can guide the search to understand why people do or do not practice health-promoting behaviors, help identify what information is needed to design an effective intervention strategy, and provide insight into how to design a program so that it is successful (39, 51). Theories and models help explain behavior, as well as suggest how to develop more effective ways to influence and change behavior. These two types of theory—explanatory theory and change theory—may have different emphases but are quite complementary. For example, understanding why an employee smokes is one step toward a successful cessation effort, but even the best explanations will not be enough by themselves to fully guide change to improve health. Some type of change model will also be needed. All the theories and models described here have some potential as both explanatory and change models, although they might be better for one or the other purpose. For example, the health belief model (20) was originally developed as an explanatory model, whereas the stages of change construct of the transtheoretical model (87) was conceived to help guide planned change efforts.

IMPORTANT THEORIES AND THEIR KEY CONSTRUCTS

Theories that gain recognition in a discipline shape the field, help define the scope of practice, and influence the training and socialization of its professionals. Today, no single theory or conceptual framework dominates research or practice in health promotion and education. However, reviews of journal articles published in the past two decades across a broad range of health behavior topics have revealed the most often used theories and trends in theory use. In a review of 116 theory-based articles published between 1986 and 1988 in two major health education journals, 51 distinct theoretical formulations were identified. At that time, the three most frequently mentioned theories were social learning theory, the theory of reasoned

HBM: health belief model

SCT: social cognitive theory

TRA: theory of reasoned action

TPB: theory of planned behavior

TTM: the transtheoretical model

action (TRA), and the health belief model (HBM) (32).

In another review of 526 articles from 24 different journals published from mid-1992 to mid-1994, the majority of all instances of theory use were accounted for by five theories: HBM; social cognitive theory (SCT) (the updated version of social learning theory) (6) and self-efficacy construct (7); the TRA and its new version, the theory of planned behavior (TPB) (2); the transtheoretical model/stages of change (TTM); and social support/social networks (33).

In our review of journal articles published in 1999 and 2000, ten theories or models clearly emerged as the most often used. The first two, and the most dominant, were SCT and TTM/stages of change. Other often-used theories and models were the HBM, social support and social networks, the TRA/TPB, stress and coping, community organization, ecological models/social ecology, and diffusion of innovations (38).

In another recent, updated review of theory use in published research between 2000 and 2005, the most often used theories were TTM, SCT, and the HBM (84). Overall, the same theories dominate late in the current decade as did in 1999 and 2000 (39). Dozens of theories and models have been used, although only a few of them were used in multiple publications and by several authors. To provide context for the rest of this review, we briefly describe the central elements of four of the most widely used theoretical models of health behavior.

Health Belief Model

The HBM was one of the first theories of health behavior and remains one of the most widely recognized in the field. It was developed to help understand why people did or did not use preventive services offered by public health departments in the 1950s (50) and has evolved to address newer concerns in prevention and detection (e.g., mammography screening, influenza vaccines) as well as lifestyle behaviors such as sexual risk behaviors and injury prevention (20).

The HBM theorizes that people's beliefs about whether they are at risk for a disease or health problem, and their perceptions of the benefits of taking action to avoid it, influence their readiness to take action (20, 36, 93). The key constructs of perceived susceptibility and perceived severity, perceived benefits and perceived barriers, cues to action, and the more recent addition of self-efficacy (95) are the core constructs of the HBM. The HBM has been applied most often for health concerns that are prevention-related and asymptomatic, such as early cancer detection and hypertension screening, where beliefs are as important or more important than overt symptoms. The HBM is also clearly relevant to interventions to reduce risk factors for cardiovascular disease (118).

Transtheoretical Model/Stages of Change

Long-term changes in health behavior involve multiple actions and adaptations over time. Some people may not be ready to attempt changes, whereas others may have already begun implementing changes in their smoking, diet, activity levels, etc. The construct of stage of change is a key element of the TTM of behavior change and proposes that people are at different stages of readiness to adopt healthful behaviors (87). The notion of readiness to change, or stage of change, has been examined in health behavior research and was found useful in explaining and predicting changes for a variety of behaviors including smoking, physical activity, and eating habits (e.g., 25, 35, 67). The TTM has also been applied in many settings (87).

Stages of change is a heuristic model that describes a sequence of steps in successful behavior change: precontemplation (no recognition of need for or interest in change), contemplation (thinking about changing), preparation (planning for change), action (adopting new habits), and maintenance (ongoing practice of new, healthier behavior) (87). People do not always move through the stages of change in a linear manner; they often recycle and repeat

certain stages (e.g., individuals may relapse and go back to an earlier stage depending on their levels of motivation and self-efficacy).

The stages of change model can be used both to help understand why people who are at high risk for diabetes might not be ready to attempt behavioral change and to improve the success of health counseling. Another application of the stages of change model in organizations and communities involves conceptualizing organizations along the stages-of-change continuum according to their leaders' and members' (e.g., employees') readiness for change (13, 86).

Social Cognitive Theory

SCT, the cognitive formulation of social learning theory that has been best articulated by Bandura (6), explains human behavior in terms of a three-way, dynamic, reciprocal model in which personal factors, environmental influences, and behavior continually interact (70). SCT synthesizes concepts and processes from cognitive, behavioristic, and emotional models of behavior change, so it can be readily applied to counseling interventions for disease prevention and management. A basic premise of SCT is that people learn not only through their own experiences, but also by observing the actions of others and the results of those actions (6, 70). Key constructs of SCT that are relevant to health behavior change interventions include observational learning, reinforcement, self-control, and self-efficacy (118). Some elements of behavior modification based on SCT constructs of self-control, reinforcement, and self-efficacy include goal-setting, self-monitoring, and behavioral contracting. As is discussed below, goal-setting and self-monitoring seem to be particularly useful components of effective interventions.

Self-efficacy, or a person's confidence in his or her ability to take action and to persist in that action despite obstacles or challenges, is especially important for influencing health behavior change efforts (7). Health providers can make deliberate efforts to increase patients' self-efficacy using three types of strategies: (*a*) setting small, incremental and achievable goals; (*b*) using formalized behavioral contracting to establish goals and specify rewards; and (*c*) monitoring and reinforcement, including patient self-monitoring by keeping records (6).

The key SCT construct of reciprocal determinism means that a person can be both an agent for change and a responder to change. Thus, changes in the environment, the examples of role models, and reinforcements can be used to promote healthier behavior. This core construct is also central to social ecological models and is more important today than ever before.

Social Ecological Model

The social ecological model helps users to understand factors affecting behavior and also provides guidance for developing successful programs through social environments. Social ecological models emphasize multiple levels of influence (such as individual, interpersonal, organizational, community, and public policy) and the idea that behaviors both shape and are shaped by the social environment (71, 100). The principles of social ecological models (of which several have been proposed) are consistent with SCT concepts, which suggest that creating an environment conducive to change is important to facilitate adoption of healthy behaviors (6). For example, given the growing epidemic of obesity in the United States and other developed countries, more attention is being focused toward examining and improving the health-promoting features of communities and neighborhoods and reducing the ubiquity of high-calorie, high-fat food choices (104, 114).

REVIEWS OF THEORY USE IN INTERVENTIONS

Which Theories Have Been Used, and With What Findings?

The analyses described in the preceding section reveal the dominant theories across the broad arena of health behavior research and trends over the past two decades. In addition

to these reviews, several reviews have also examined which theories were used and whether theory-based strategies are positively associated with desirable effects. One important indicator of increased attention to theory in evidence reviews is inclusion of description and coding of the theoretical bases of interventions in authoritative systematic reviews such as those conducted by the Task Force on Community Preventive Services (121).

Table 1 summarizes 11 systematic reviews published since 2000—most within the past two years—that reported on theory use and, in several cases, the effects of using theories for intervention design. They cover a range of behavioral topics: dietary fat and fruit and vegetable intake (4), cancer screening (3, 63), injury prevention (108), HIV-related sexual risk behaviors (77, 79, 81), and contraception (65). These reviews also examined tailored print and computer-based interventions (3, 66, 78, 79).

As shown in **Table 1**, the most-often used theories in the areas reviewed are SCT, the TTM/stages of change, the HBM, the TPB, and the PRECEDE/PROCEED planning model. These findings are similar to those in general reviews of the literature (above) and show that a small number of theories are being used to develop and test interventions.

Few of these reviews compared the relative effects of using different theories as the basis for interventions, but several explored whether having a theoretical foundation led to larger effects. Several reviews concluded that interventions based on theory or explicitly described theoretical constructs were more effective than those not using theory (3, 4, 63, 65, 77–79). The mechanisms that explain these larger effects have not been studied. The use of theories that fit well with the problems and context in the studies might explain the success of theory-based interventions. It is equally plausible that theory-based strategies are developed with greater care, fidelity, and structure. There may be other explanations as well.

Most of these reviews examined individual and small-group interventions, and few addressed organizational change or provider behavior (111) or community-level interventions (97). The absence of these broader-level reviews mirrors the smaller literature base of empirical research that uses theories at the organizational and community levels (39).

How Has Theory Been Used?

Along with published observations about which theories are being used, concerns have been raised about how the theories are used (or not used) in research and practice (84, 108, 115). A common refrain is that researchers may not understand how to measure and analyze constructs of health behavior theories (69, 89) or that they may pick and choose variables from different theories in a way that makes it difficult to ascertain the role of theory in intervention development and evaluation.

Building on our earlier distinctions among the type and degree of theory use (31), Painter and colleagues' recent review of theory use from 2000 to 2005 (84) classified articles that employed health behavior theory along a continuum: (*a*) informed by theory (a theoretical framework was identified, but no or limited application of the theory was used in specific study components and measures), (*b*) applied theory (a theoretical framework was specified, and several of the constructs were applied in components of the study), (*c*) tested theory (a theoretical framework was specified, and more than half the theoretical constructs were measured and explicitly tested, or two or more theories were compared with each other in a study), or (*d*) building/creating theory (new or revised/expanded theory was developed using constructs specified, measured, and analyzed in a study). Of all the theories used in the sample of articles ($n = 69$ articles using 139 theories), 69.1% used theory to inform a study, 17.9% of theories were applied, 3.6% were tested, and only 9.4% involved building/creating theory (84). These findings are consistent with the calls by Noar & Zimmerman (82) and Weinstein & Rothman (116) for more thorough application and testing of health behavior theories to advance science and move the field forward.

Table 1 Reviews of theory use in health behavior intervention research[a]

Article	Topical focus	Theories used	Comments
Ammerman et al. 2002 (4)	Dietary fat, fruit and vegetable (F&V) consumption	Theory use yes/no; SCT constructs (goal setting); social support	Using a theoretical basis was associated with greater fat reduction and higher F&V intake Goal setting, family, and social support strategies were more effective.
Legler et al. 2002 (63)	Mammography promotion in historically underserved groups	Theory used in 68.4% of included studies. Most used: HBM, TTM, SCT, PRECEDE/PROCEED	Strongest interventions were access-enhancing, consistent with SCT, HBM, and ecological model.
Trifiletti et al. 2005 (108)	Unintentional injury prevention research	Most used: TRA/TPB, HBM, PRECEDE/PROCEED model	Theories were not well represented in injury prevention research from 1980 to 2001.
Noar et al. 2007 (78)	Tailored print health behavior change interventions	TTM/stages of change, HBM, TRA/TPB, most used. Nearly every study tailored on at least one theoretical concept	Tailoring with 4–5 concepts yielded larger effect sizes than did tailoring on 0–3 concepts. Nearly all studies that tailored on theoretical constructs had larger effect sizes.
Joronen et al. 2008 (59)	School-based drama interventions	SCT, TTM	Use of SCT was most common (role models, interaction, etc). Mostly positive effects were found.
Noar 2008 (77)	Reducing HIV-related sexual risk behavior; review of 18 meta-analyses	Most often mentioned: self-management, problem-solving training, skills training with SCT concepts	3 meta-analyses found theory-based strategies to be superior, 2 showed possible evidence, and 2 were null or against theory-based components.
Albada et al. 2009 (3)	Tailored information about cancer risk and screening	Most used were TTM, HBM, SCT, and PAPM	Review suggested that theory-based interventions are most effective.
Lopez et al. 2009 (65)	Interventions for contraception (non-high-risk groups)	SCT was the main theoretical basis in most trials	Theory-based intervention groups had more positive results in most trials
Lustria et al. 2009 (66)	Computer-tailored interventions delivered over the Web; various behaviors (diet, activity, alcohol, smoking)	Most used theories are SCT, TTM, and TRA/TPB. Most studies indicated a theoretical framework.	Use of multiple theories and concepts was common because online computer-tailored strategies are more complex than print tailoring.
Noar et al. 2009 (79)	Computer technology–based HIV prevention interventions	Theories used: SCT, TPB, IMB, and TTM	Interventions using TTM/stages of change and individual tailoring were most effective.
Noar et al. 2009 (81)	HIV/AIDS mass communication campaigns	Mass communication theories used; message content based on HBM, SCT, TTM, TPB, and others	44% of campaigns reported using theory, mainly for message design.

[a]Abbreviations: F&V, fruits and vegetables; HBM, health belief model; IMB, integrated model of behavior; PAPM, precaution adoption process model; SCT, social cognitive theory; TPB, theory of planned behavior; TRA, theory of reasoned action; TTM, transtheoretical model.

NBCCEDP: National Breast and Cervical Cancer Early Detection Program

Well-Integrated Screening and Evaluation for Women Across the Nation (WISEWOMAN) program: public health program to offer risk factor–screening and lifestyle interventions to low-income women at NBCCEDP cancer-screening locations

A further concern relates to the external validity of studies that test theory-based interventions (42). The difficulty of reliably translating theory into interventions to improve clinical effectiveness has led to calls for more "pragmatic trials" (116) and increasing attention to the generalizability and translation of interventions into real-world clinical practice (80, 96) and community settings (42, 83, 91). These important issues should encourage us to question how we use theory, how we test theory, how we turn theories into interventions, and what conclusions we draw from research.

APPLICATIONS OF THEORY IN PUBLIC HEALTH INTERVENTIONS

Current examples of large-scale women's health interventions and a statewide health-improvement program illustrate the application, opportunities, and challenges of developing, delivering, disseminating, and evaluating theory-based and theory-informed public health programs. This section describes these programs to highlight applications of social and behavioral science theory for health improvement.

Women's Health Programs

Large, widely disseminated women's health programs have largely used behavioral science theories to help develop core interventions and to train managers and interventionists to conduct programs for diverse groups of women in a wide range of locales. The National Breast and Cervical Cancer Early Detection Program (NBCCEDP) was established in 1991 as a nationwide, comprehensive public health program to increase access to breast and cervical cancer–screening services for medically underserved women (48). The WISEWOMAN project (Well-Integrated Screening and Evaluation for Women Across the Nation) provides cardiovascular disease risk factor–screening and lifestyle interventions to under- and uninsured women in conjunction with the NBCCEDP in many states (107, 119).

Analysis of theory use in recruitment and professional development in the NBCCEDP. The NBCCEDP has expanded and operated continuously for nearly two decades and currently operates in all 50 states, five U.S. territories, and 12 American Indian/Alaska Native tribal organizations to provide screening services for breast and cervical cancer. The program screens hundreds of thousands of women each year (19). The program has narrowed the gap in early detection for breast and cervical cancers between white women and African Americans but not for Hispanics (1).

Two of the major components of the NBCCEDP are interventions to improve how health care professionals perform their jobs—professional development—and interventions to enroll, or recruit, eligible women into breast and cervical cancer–screening services (18). These program components parallel the types of interventions to promote screening that were systematically reviewed by the Task Force on Community Preventive Services (106): "provider-directed" and "client-directed" interventions (9, 10, 98). These types of interventions often have foundations in behavioral science theory (55, 63), and experts have concluded that the application of theory can contribute to their effectiveness (23, 55, 63).

Escoffery (29) recently completed interviews with 59 program-development coordinators and 61 recruitment coordinators in NBCCEDP programs. The main aims of the study were to inventory NBCCEDP grantees' recruitment and professional development activities, to assess the extent to which evidence-based cancer-prevention strategies were used, and to understand the bases for and evaluation of these strategies.

The interviewers asked respondents if one or more theories were used as a basis for intervention strategies. Responses to open-ended questions were coded by two independent coders. Just under 50% of respondents stated that a theory or theories were used to design the professional development

(provider-directed) strategies. The most commonly mentioned theories were adult learning theory, social influence theory, diffusion of innovations, and stages of change. For recruitment, or client-directed strategies, 27% of responding coordinators named one or more theories, including social marketing, stages of change/TTM, HBM, social influence theory, social networks, and peer-to-peer theory. A few people responded by merely listing a concept or term, not a theory; and others said they thought that a theory was used to design the strategy or system, but they did not know what it was called (29). When asked why particular professional-development or recruitment activities were chosen, some of the most common reasons for each were the organization's support, the low cost, and the ease of implementation of the activity (29).

These findings provide a window to the world of public health practice and indicate that practitioners—in this case, program coordinators—have a moderate level of awareness of theory and theoretical constructs that are used in their interventions. The role of theory in ongoing program planning and evaluation for the NBCCEDP appears to be secondary to practical concerns. This is not surprising and raises the question of how, and at which level, practitioners can best integrate theory into large-scale public health programs.

The role of theory in the WISEWOMAN program: lifestyle interventions, community linkages, and environment and organizational change. The WISEWOMAN program began in 1995 in three states (phase I, 1995–1998), was expanded to 16 state and tribal health agencies (phase II, 1999–2007), and currently funds 21 programs in phase III (since June 2008) (107, 118, 119; **http://www.cdc.gov/WISEWOMAN/**). The program offers assessments of cardiovascular disease (CVD) risk factors (blood pressure, cholesterol, smoking, weight, diet, and physical activity) to low-income and uninsured women at NBCCEDP cancer-screening locations. Data from these screening assessments have consistently revealed high rates of risk factors among those attending the program: More than 80% of women have at least one risk factor, and more than three-fourths are overweight or obese (92, 102, 107, 118).

CVD: cardiovascular disease

From the beginning, WISEWOMAN program sites have conducted and evaluated lifestyle change interventions to reduce CVD risk through improved nutrition and increased physical activity (107). Although interventions vary across project sites, the "enhanced interventions" are required to be evidence-based, culturally relevant to local populations, and grounded in behavioral science theory (107, 118). The first project sites used strategies based on the socioecologic model, SCT, stages of change/TTM, social support and lay health advisors, and the HBM (107). Two core constructs are included in the standard intermediate measures: readiness to change and barriers to behavior change. Readiness to change is a key construct of the TTM, and barriers to change can be conceptualized as related to the HBM, the TTM, social cognitive theory, and other theories.

The lifestyle change interventions are locally tailored and vary in intensity and have been evaluated in several studies, including randomized controlled trials, quasi-experiments, case studies, and mixed-method evaluations (14, 15, 30, 54, 61, 64, 92, 102, 110). The data clearly show that lifestyle interventions delivered in WISEWOMAN are feasible and acceptable for reaching socially and medically vulnerable women (46, 118). Comparisons of minimal interventions and enhanced interventions of various types have revealed that enhanced interventions achieved incrementally greater, but modest, changes in nutrition, physical activity, and some risk factors (118).

A close look at the theoretical bases of the interventions and published program evaluations is useful in analyzing the strengths and limitations of WISEWOMAN, which by all accounts is an exemplary public health intervention that has grown to be widely disseminated for more than a decade. The

RE-AIM model: Reach, Efficacy, and Adoption, Implementation, Maintenance Model

SHIP: Statewide Health Improvement Program (Minnesota)

focal theoretical constructs used in counseling sessions usually focus on self-monitoring, readiness to change, self-efficacy, social support, goal-setting with monitoring and reinforcement, and overcoming barriers (118). Cross-cutting themes—often lumped with "theory" but not actually theories at all—include individual tailoring and multiculturalism (107, 118).

Case studies with program leaders and managers from the first three WISEWOMAN states yielded important lessons about these interventions. First, respondents identified the need to change organizational culture and provider practices at the clinical sites. Second, they noted that reaching beyond a focus on individuals is a key challenge (110). A survey of counselors in the program by Jilcott and others (58) showed that those who had conducted enhanced intervention sessions had higher self-efficacy for their effectiveness and spent more time with participants. They commonly cited the lack of time as a barrier and reported challenges to the program's sustainability. The findings suggest that organizational and environmental challenges may interact with the effectiveness of individual counseling and may even impede its effectiveness.

WISEWOMAN program managers and funders increasingly began to recognize that the focus on individual behavior change might limit the program's potential to influence CVD disparities successfully. They spoke of the need to incorporate environmental and organizational strategies (74, 120), potentially bringing the program closer to the central tenets of the socioecological framework (5, 71, 100). A North Carolina Enhanced WISEWOMAN program was developed to better link clinical care to community resources, integrating chronic care model elements into the existing WISEWOMAN model (57). An analysis (by these authors) of the recommended interventions suggests that several of the enhanced interventions in the program focus on encouraging patients to try to change their environments rather than having the program or its staff mobilize social or built environment change (e.g., increasing available healthy food, reducing the cost of physical activity programs).

Two unique, recent studies of WISEWOMAN used the RE-AIM framework (Reach, Efficacy, and Adoption, Implementation, Maintenance), an evaluation model that fits well with theory-driven programs (42). The first study used a mixed-method approach that compared high- and low-performing sites to identify best practices for WISEWOMAN programs (14). High performers were more likely to ensure that appropriate behavior change theory was understood and applied by staff in lifestyle interventions and to train local staff on how to use behavior change theories for their clients and to reinforce their own behavior (15). The second study used WISEWOMAN and NBCCEDP data to compare two high-performance sites with two low-performance sites on all five RE-AIM dimensions. They concluded that RE-AIM provides a richer measure of how contextual factors operate in successful programs than do evaluation approaches that are merely effectiveness-focused (30).

The WISEWOMAN program provides substantial food for thought and is an important application using theory, research, and practice in a large public health intervention. The lifestyle counseling components are well aligned with behavioral theories. Many future challenges for the future of the program point to the need for increased use of a social ecological model (119).

Minnesota Statewide Health Improvement Program. The Statewide Health Improvement Program (SHIP) was developed in response to the 2007 Minnesota Legislature's request to develop a plan for statewide health promotion to address the rising cost of health and health care. The goal of SHIP (**http://www.health.state.mn.us/healthreform/ship**) is to reduce the burden of chronic disease by reducing the percentage of Minnesotans who use or are exposed to tobacco and who are obese or overweight. SHIP is modeled after Steps to a Healthier US (**http://www.cdc.gov/steps**), a federal initiative tested in four Minnesota

communities. Building on the successes of Steps, SHIP was designed to use effective, evidence-based strategies to create changes in policies, environments, and systems to support healthy behaviors in communities throughout Minnesota.

The approach taken by SHIP communities follows an ecological model, supporting multiple levels of influence on behavior, i.e., intrapersonal, interpersonal, organizational, community, and public policy (100). An ecological model provides a framework to guide healthy community initiatives to include not only individuals and families, but also institutions, systems, and the social and physical environments of a community. SHIP applies the New Spectrum of Prevention (21), which was first developed in 1982 by a county public health agency (and modified in 1996). This framework reflects the core tenets of the ecological model (100) through seven levels: (*a*) strengthening individual knowledge and skills, (*b*) promoting community education, (*c*) educating providers, (*d*) fostering coalitions and networks, (*e*) changing organizational practices, (*f*) mobilizing neighborhoods and communities, and (*g*) influencing policy and legislation.

For years, local public health in Minnesota has practiced primarily at the first three levels. Recently, and especially around tobacco, the focus has broadened to include the latter four levels. To further support this trend and achieve fundamental changes in environments likely to support and sustain healthy behaviors, the SHIP community grantees will focus principally on these broader levels in the spectrum. To help accomplish this change in focus, the SHIP communities will select their interventions from a Menu of Interventions included in the recent request for proposals.

Each intervention in the Menu(s) meets several criteria. Interventions should address at least one SHIP risk factor (tobacco, physical activity, nutrition); occur in at least one SHIP setting (school, community, work site, or health care); be population-based versus individual-based; emphasize prevention versus individual treatment; address policy, systems, or environmental change; be evidence-based or use practice-based evidence; and have associated evaluation outcomes.

CDC: Centers for Disease Control and Prevention

All interventions selected to be included in the Menu underwent a rigorous review process conducted by the Minnesota Department of Health (MDH) and by multiple stakeholders including representatives from the Centers for Disease Control and Prevention (CDC), health care providers, nonprofit organizations, legal organizations, cultural groups, University of Minnesota and Extension Services, local public health agencies, tribal governments, and other state government agencies (26).

The majority of the physical activity and tobacco interventions on the Menu of Interventions are based on either the CDC's *Guide to Community Preventive Services* (121) or CDC's "Best Practices for Comprehensive Tobacco Control Programs." These publications and their supporting documents are considered gold standards for selecting evidence-based strategies. Programmatic interventions were either excluded or built into broader policy, system, and environmental interventions as action steps.

Some of the action steps for implementing interventions in the SHIP "Guide to Implementing and Evaluating Interventions" (103) are based on the CDC's and the Partnership for Prevention's publication "The Community Health Promotion Handbook: Action Guides to Improve Community Health." These action guides provide how-to guidance for implementing effective community-level health-promotion strategies that, in keeping with an ecological model, promote interventions that go beyond the individual level to target broad social and environmental factors (*Community Health Promotion Handbook*: **http://www.prevent.org/actionguides/HandbookIntroduction.pdf**).

Despite the growing emphasis on community-based health promotion, most such programs have demonstrated only modest impact (73), which is due in part to weaknesses in application of available theoretical models. Ecological models provide an important

framework but generally do not provide enough detail to conceptualize adequately the relationship between multiple interventions and multiple levels of influence that include the larger community (8, 85). Ecological models that are behavior-specific need to be articulated better (100).

Merzel & D'Afflitti (73) make the point that the most developed theories are based on behavioral psychology and tend to result in interventions that focus on individual change and do not adequately consider contextual factors that influence behavior. For example, although SCT acknowledges social influence, it says little about the effect of the physical environment or neighborhood issues, such as high rates of unemployment, on behavior.

Because mediating influences within the context of communities are often not adequately recognized, measured, or reported, it is often not possible to assess program processes and outcomes adequately (16). Although many community-based programs emphasize community participation and collaboration, few have demonstrated strong impacts on behavioral or health status outcomes (73). This lack of strong impact points to the need for interventions that are based on an integrated theory of ecological change that targets social and policy influences through an "intensive process of community mobilization" that goes well beyond having quarterly community advisory board meetings (72).

Key decision makers within a community often function within limited time frames, especially when planning is tied to funding. Because social norms and the physical environment of a community can take years to show meaningful change, ecological models that account for a long, often slow chain of events are necessary both to program design and to help decision makers understand the need for patience and continued support. This approach needs to be combined with ongoing, concerted efforts to achieve policy, systems, and environmental change.

Ecological models can be better used by large programs, such as SHIP, to develop and implement improved measurement methods, advances in multilevel analyses, models specific to each target behavior, and dedicated, multiyear funding for environmental and policy research (62, 100, 113). The new SHIP program is an opportunity to grow and improve these applications.

CONSTRUCTS AND ISSUES ACROSS THEORIES

Several key constructs cut across the most often cited models for understanding behavior and behavior change: environmental influences, behavior change as a multistage process, intention versus action, and changing of behavior versus maintenance of behavior change (34, 76).

Environmental Influences

An increasingly widely held view demonstrates that social, organizational, and physical environments are important determinants of behavior (71, 101). Environments, and people's perceptions of their environments, may constrain individuals' behavior even when they are highly motivated. Environment and policy concerns are often central to health disparities: Having access to walkable communities, safe parks, and recreational facilities is associated with more physical activity and lower risk of obesity, but communities of color often have less access to such resources in their neighborhoods (88). Well-designed interventions based on an ecological model have great potential to help reduce or eliminate such environmental health inequities (88, 99, 120). Equally important, the concept of environment is central to several leading theoretical frameworks (6, 70, 71, 100) and is also important to keep in mind when applying individually oriented theories, as noted above.

Behavior Change as a Process

Research conducted over the past 30 years shows that the relationships among knowledge, awareness of the need to change, intention

to change, and an actual change in behavior are very complex. Sustained health behavior change involves multiple actions and adaptations over time. One central issue that has gained wide acceptance in recent years is the simple notion that behavior change is a process, not an event. It is not a question of someone deciding one day to quit smoking and the next day becoming a nonsmoker for life. This idea is not new, but it has gained wider recognition in the past few years. Although the stages of change construct is most recognized for cutting across various circumstances of individuals who need to change or want to change, other theories also address these processes. The TPB (2) and the Precaution Adoption Process Model (117) also explicitly identify cognitive stages of readiness and decisions to take action.

Intentions versus Action

The TTM makes a clear distinction between the stages of contemplation and preparation and overt action (87). A further application of this distinction comes from the TPB (2). The TPB proposes that intentions are the best predictors of behavior. "Implementation intentions" are even more proximal and may be better predictors of behavior and behavior change (44).

Changing Behaviors versus Maintaining Behavior Change

Even when there is good initial compliance to a lifestyle change program, such as quitting smoking or adopting an exercise routine, relapse is common. For example, many smokers quit, only to begin smoking again within a year. Undertaking initial behavior changes and maintaining behavior change require different types of strategies. The TTM distinction between the action and maintenance stages implicitly addresses this phenomenon (87). Relapse prevention specifically focuses on strategies for addressing maintenance of a recently changed behavior (68). It involves developing self-management and coping strategies and establishing new behavior patterns that emphasize perceived control, environmental management, and improved self-efficacy. These strategies are an eclectic mix drawn from SCT (70), the TPB (2), applied behavioral analysis, and the forerunners of the stages of change model.

CHALLENGES AND UNRESOLVED ISSUES

Selecting the Right Theory or Theories

Effective health promotion and public health depend on marshaling the most appropriate theory and practice strategies for a given situation (39, 53, 78). The choice of a suitable theory should begin with identifying the problem, goal, and units of practice (105, 109), not with selecting a theoretical framework because it is intriguing, familiar, or in vogue. As Green & Kreuter (45) have argued, ideally one should start with a logic model of the problem and work backward to identify potential solutions.

Theories may be judged in different ways in the context of activities of practitioners and researchers. However, theory, research, and practice are closely entwined phenomena, not separate issues (27, 39, 51, 56). Practitioners may apply the pragmatic criterion of usefulness to a theory and be concerned mainly with its consistency with everyday observations (17). Researchers may be more concerned with whether theory or a theoretically based intervention is found to be supported when empirically tested. We should test our theories iteratively in the field (49, 94), as well as in more controlled settings. When we do so, theory, research, and practice are more likely to converge.

When Is a New Theory Needed?

As noted above in the description of theory use in published articles, there are many theories available, but few are being widely used. Developers often state that existing theories

do not meet their needs, so a new theory or model is necessary. However, careful thought about the generalizability, testability, and support for a "new" theory might instead lead to the choice of a suitable theory, to minor adaptations for unique cultural groups, and to modified measures and evaluation procedures. Work with culturally diverse groups provides a case in point. Fundamental views of matters such as causes of health and disease among some ethnic groups may seem to point to a need for new theories (28). However, familiarity with a range of theories and thoughtful selection of the best-suited theories might solve this problem (82). An Institute of Medicine committee concluded that "the evidence is quite thin about differential effects" of theory-based interventions according to diversity subgroups (53).

Population-Focused Programs and Individual-Focused Strategies

In population-focused programs, it is of limited value to adopt a program oriented solely toward modifying individuals' behaviors (e.g., teaching a patient low-fat food cooking methods). A more productive strategy would also include environmental change, for example expanding the availability and affordability of more nutritious food choices (40, 41). When this step is done along with individual skill training, longer-lasting and meaningful changes can be achieved. Many theories of policy and organizational change complement individually oriented theories, but they are underutilized (47, 52). They should be further operationalized, tested, and disseminated.

FUTURE DIRECTIONS

The audience for health behavior change programs is truly global, and the professional community represents many different settings and countries. Theory developers and theory users must more than ever consider how culture, context, and health problems can and should affect their choices and applications of theory and interventions (37). Professionals designing interventions have more options than ever before, yet our theories have improved only incrementally; our technologies have changed exponentially, however. This situation should be a wake-up call to public health practitioners to think more concretely, expansively, and deeply about how they and their coworkers use theory.

We offer to readers some key cross-cutting propositions to put the use of health behavior theory in perspective (37).

1. The strongest interventions may be built from multiple theories. When combining theories, it is important to clearly think through the unique contribution of different theories to the combined model.
2. Rigorous tests of theory-based interventions, including measurement and analyses of mediator and moderators, are the building blocks of the evidence base in health behavior change. These evaluations should not be limited to randomized trials of efficacy, but instead should also be tied to planning and evaluation frameworks such as RE-AIM (30, 43) and PRECEDE/PROCEED (45).
3. Theory, research, and practice are part of a continuum for understanding the determinants of behaviors, testing strategies for change, and disseminating effective interventions (60, 90).
4. There is no substitute for knowing the audience. Participatory program design, evaluation, and research improve the odds of success.
5. When planning interventions, strive to be creative. Health-promotion interventions should be as entertaining and engaging as the other activities with which they compete. No matter how important health communication and education activities are, they are secondary to attracting and retaining the interest and enthusiasm of the audience.

SUMMARY POINTS

1. Reviews of research on changing a variety of health behaviors have shown that interventions based on theory or theoretical constructs are more effective than are those not using theory. However, the mechanisms that explain the larger effects have not been studied.
2. The most often used theories of health behavior are social cognitive theory (SCT), the transtheoretical model (TTM)/stages of change, the health belief model (HBM), and the theory of planned behavior (TPB).
3. The most often mentioned theoretical model that has not been fully applied in research and practice is the social ecological model. There are many needs to better articulate, apply, and evaluate this important and promising model.
4. Health-promotion and public health researchers and practitioners should both question and improve how thoroughly we use theory, how we turn theories into interventions, how we test theories, and what conclusions we draw from research.
5. Health-promotion programs that address significant public health problems including health disparities should complement individually oriented intervention models with strategies and models to develop healthier policies, systems, and environments.

FUTURE ISSUES

1. Theory, research, and practice are part of a continuum for understanding the determinants of behaviors, testing strategies for change, and disseminating effective interventions (60, 90).
2. The strongest interventions may be built from multiple theories. When combining theories, it is important to think through clearly the unique contribution of different theories to the combined model.
3. Rigorous tests of theory-based interventions, including measurement and analyses of mediator and moderators, are the building blocks of the evidence base in health behavior change. These evaluations should not be limited to randomized trials of efficacy but should also be tied to planning and evaluation frameworks such as RE-AIM (30, 43) and PRECEDE/PROCEED (45).
4. There is no substitute for knowing the audience. Participatory program design, evaluation, and research improve the odds of success.
5. The question of when a new theory is needed requires careful thought and more attention. There are many theories, although few are widely used.
6. When planning interventions, we should strive to be creative. Health-promotion interventions should be as entertaining and engaging as the other activities with which they compete. Communication technologies are opening up many different channels for engaging people's interest in better health. No matter how important they are, health communication and education are secondary to attracting and retaining the interest and enthusiasm of the audience.

DISCLOSURE STATEMENT

The authors are not aware of any affiliations, memberships, funding, or financial holdings that might be perceived as affecting the objectivity of this review.

LITERATURE CITED

1. Adams EK, Breen N, Joski PJ. 2007. Impact of the National Breast and Cervical Cancer Early Detection Program on mammography and Pap test utilization among white, Hispanic, and African American women: 1996–2000. *Cancer* 109:348–58
2. Ajzen I. 1991. The theory of planned behavior. *Org. Behav. Hum. Decis. Proc.* 50:179–211
3. Albada A, Ausems MG, Bensing JM, van Dulmen S. 2009. Tailored information about cancer risk and screening: a systematic review. *Patient Educ. Couns.* 75:155–71
4. Ammerman AS, Lindquist CH, Lohr KN, Hersey J. 2002. The efficacy of behavioral interventions to modify dietary fat and fruit and vegetable intake: a review of the evidence. *Prev. Med.* 35:25–41
5. Anderson AS. 2007. Nutrition interventions in women in low-income groups in the UK. *Proc. Nutr. Soc.* 66:25–32
6. Bandura A. 1986. *Social Foundations of Thought and Action: A Social Cognitive Theory*. Englewood Cliffs, NJ: Prentice-Hall
7. Bandura A. 1997. *Self-Efficacy: The Exercise of Control*. New York: WH Freeman
8. Barnett E, Anderson T, Blosnich J, Halverson J, Novak J. 2005. Promoting cardiovascular health: from individual goals to social environmental change. *Am. J. Prev. Med.* 29(5 Suppl. 1):107–12
9. Baron RC, Rimer BK, Breslow RA, Coates RJ, Kerner J, et al. 2008. Client-directed interventions to increase community demand for breast, cervical, and colorectal cancer screening: a systematic review. *Am. J. Prev. Med.* 35:S34–55
10. Baron RC, Rimer BK, Coates RJ, Kerner J, Kalra GP, et al. 2008. Client-directed interventions to increase community access to breast, cervical, and colorectal cancer screening: a systematic review. *Am. J. Prev. Med.* 35:S56–66
11. Bartholomew LK, Parcel GS, Kok G, Gottlieb NH. 2006. *Planning Health Promotion Programs: An Intervention Mapping Approach*. San Francisco: Jossey-Bass
12. Bernstein R. 1971. *Praxis and Action*. Philadelphia: Univ. Penn. Press
13. Berry TR, Plotnikoff RC, Raine K, Anderson D, Naylor PJ. 2007. An examination of the stages of change construct for health promotion within organizations. *J. Health Organ. Manag.* 21:121–35
14. Besculides M, Zaveri H, Farris R, Will J. 2006. Identifying best practices for WISEWOMAN programs using a mixed-methods evaluation. *Prev. Chronic Dis.* 3:A07
15. Besculides M, Zaveri H, Hanson C, Farris R, Gregory-Mercado K, Will J. 2008. Best practices in implementing lifestyle interventions in the WISEWOMAN program: adaptable strategies for public health programs. *Am. J. Health Promot.* 22:322–28
16. Bhattacharyya O, Reeves S, Garfinkel S, Zwarenstein M. 2006. Designing theoretically-informed implementation interventions: fine in theory, but evidence of effectiveness in practice is needed. *Implement Sci.* 1:5
17. Burdine JN, McLeroy KR. 1992. Practitioners' use of theory: examples from a workgroup. *Health Educ. Q.* 19:331–40
18. Cent. Dis. Control Prev. 2007. *NBCCEDP Program Guidance Manual*
19. Cent. Dis. Control Prev. 2008/2009. *National Breast and Cervical Cancer Early Detection Program Fact Sheet*. **http://www.cdc.gov/cancer/nbccedp/bccpdfs/0809_nbccedp_fs.pdf**
20. Champion VL, Skinner CS. 2008. The health belief model. See Ref. 39, pp. 45–65
21. Cohen L, Swift S. 1999. The spectrum of prevention: developing a comprehensive approach to injury prevention. *Injury Prev.* 5:203–7
22. Danaei G, Ding EL, Mozaffarian D, Taylor B, Rehm J, et al. 2009. The preventable causes of death in the United States: comparative risk assessment of dietary, lifestyle, and metabolic risk factors. *PLoS Med.* 6(4):e1000058

23. Davis DA, Taylor-Vaisey A. 1997. Translating guidelines into practice. A systematic review of theoretic concepts, practical experience and research evidence in the adoption of clinical practice guidelines. *Can. Med. Assoc. J.* 157:408–16
24. DiClemente RJ, Crosby RA, Kegler MC, eds. 2002. *Emerging Theories in Health Promotion Practice and Research*. San Francisco: Jossey-Bass
25. Dijkstra A, DeVries H, Roijackers J. 1999. Targeting smokers with low readiness to change with tailored and non-tailored self-help materials. *Prev. Med.* 28:203–11
26. Dir. Health Promot. Educ. 2006. *Public Health Solutions Through Changes in Policies, Systems, and the Built Environment: Specialized Competencies for the Public Health Workforce*, J Emery, C Crump. Washington, DC: Dir. Health Promot. Educ.
27. D'Onofrio CN. 1992. Theory and the empowerment of health education practitioners. *Health Educ. Q.* 19:385–403
28. Elder JP, Ayala GX, Parra-Medina D, Talavera GA. 2009. Health communication in the Latino community: issues and approaches. *Annu. Rev. Public Health* 30:227–51
29. Escoffery C. 2009. Inventory and Assessment of National Breast and Cervical Cancer Early Detection Programs (NBCCEDP) Interventions: Professional Development Interviews and Recruitment Interviews. Unpublished Rep.
30. Farris RP, Will JC, Khavjou O, Finkelstein EA. 2007. Beyond effectiveness: evaluating the public health impact of the WISEWOMAN program. *Am. J. Public Health* 97:641–47
31. Glanz K. 2002. Perspectives on using theory. In *Health Behavior and Health Education: Theory, Research, and Practice*, ed. K Glanz, BK Rimer, K Viswanath, pp. 545–58. San Francisco: Jossey-Bass. 3rd ed.
32. Glanz K, Lewis FM, Rimer BK, eds. 1990. *Health Behavior and Health Education: Theory, Research, and Practice*. San Francisco: Jossey-Bass
33. Glanz K, Lewis FM, Rimer BK, eds. 1996. *Health Behavior and Health Education: Theory, Research, and Practice*. San Francisco: Jossey-Bass. 2nd ed.
34. Glanz K, Oldenburg B. 2001. Utilizing theories and constructs across models of behavior change. In *Changing Patient Behavior: Improving Outcomes in Health and Disease Management*, ed. R Patterson, pp. 25–40. San Francisco: Jossey-Bass
35. Glanz K, Patterson RE, Kristal AR, Feng Z, Linnan L, et al. 1998. Impact of work site health promotion on stages of dietary change: The Working Well Trial. *Health Educ. Behav.* 25:448–63
36. Glanz K, Rimer BK. 1995. *Theory at a Glance: A Guide to Health Promotion Practice*. NIH Publ. 97-3896. Bethesda, MD: Natl. Cancer Inst.
37. Glanz K, Rimer BK. 2008. Perspectives on using theory: past, present and future. See Ref. 39, pp. 509–17
38. Glanz K, Rimer BK, Lewis FM, eds. 2002. *Health Behavior and Health Education: Theory, Research, and Practice*. San Francisco: Jossey-Bass. 3rd ed.
39. Glanz K, Rimer BK, Viswanath K, eds. 2008. *Health Behavior and Health Education: Theory, Research, and Practice*. San Francisco: Jossey-Bass. 4th ed.
40. Glanz K, Sallis JF, Saelens BE, Frank LD. 2005. Healthy nutrition environments: concepts and measures. *Am. J. Health Promot.* 19:330–33
41. Glanz K, Yaroch A. 2004. Strategies for increasing fruit and vegetable intake in grocery stores and communities: policy, pricing, and environmental change. *Prev. Med.* 39:S75–80
42. Glasgow RE, Emmons KM. 2007. How can we increase translation of research into practice? Types of evidence needed. *Annu. Rev. Public Health* 28:413–33
43. Glasgow RE, Linnan LA. 2008. Evaluating theory-based interventions. See Ref. 39, pp. 487–508
44. Gollwitzer PM. 1999. Implementation intentions: strong effects of simple plans. *Am. Psychol.* 54:493–503
45. Green LW, Kreuter MW. 2005. *Health Promotion Planning: An Educational and Ecological Approach*. New York: McGraw-Hill. 4th ed.
46. Gregory-Mercado KY, Will J, True S, Royalty J, Starcher ET 2nd, et al. 2007. A combined approach to women's health is associated with a greater likelihood of repeat mammography in a population of financially disadvantaged women. *Prev. Chronic Dis.* 4:A89
47. Grol RP, Bosch MC, Hulscher ME, Eccles MP, Wensing M. 2007. Planning and studying improvement in patient care: the use of theoretical perspectives. *Milbank Q.* 85:93–138

30. Examines how success of a program differs if evaluated for effectiveness alone versus for reach, effectiveness, adoption, implementation, and maintenance.

36. Serves as a resource for public health practitioners seeking a concise summary of health behavior theories and their use.

39. Describes theoretical frameworks for health behavior and their application in research and practice.

48. Henson RM, Wyatt SW, Lee NC. 1996. The National Breast and Cervical Cancer Early Detection Program: a comprehensive public health response to two major health issues for women. *J. Public Health Manag. Pract.* 2:36–47
49. Hiatt RA, Rimer BK. 1999. A new strategy for cancer control research. *Cancer Epidemiol. Biomark. Prev.* 8:957–64
50. Hochbaum GM. 1958. *Public Participation in Medical Screening Programs: A Socio-Psychological Study*. Washington, DC: US Dept. Health, Educ. Welf.
51. Hochbaum GM, Sorenson JR, Lorig K. 1992. Theory in health education practice. *Health Educ. Q.* 19:295–313
52. Howze EH, Redman LJ. 1992. The uses of theory in health advocacy: policies and programs. *Health Educ. Q.* 19:368–83
53. Inst. Med. 2002. *Speaking of Health: Assessing Health Communication Strategies for Diverse Populations*. Washington, DC: Natl. Acad. Press
54. Jacobs AD, Ammerman AS, Ennett ST, Campbell MK, Tawney KW, et al. 2004. Effects of a tailored follow-up intervention on health behaviors, beliefs, and attitudes. *J. Womens Health* 13:557–68
55. Jamtvedt G, Young JM, Kristoffersen DT, O'Brien MA, Oxman AD. 2006. Audit and feedback: effects on professional practice and health care outcomes. *Cochrane Database Syst. Rev.* 2003:CD000259
56. Jenkins SK, Thomas MB. 2005. Thought for application and application with thought: issues in theoretical thinking and practical wisdom. *Adv. Health Sci. Educ. Theory Pract.* 10:115–23
57. Jilcott SB, Keyserling TC, Samuel-Hodge CD, Rosamond W, Garcia B, et al. 2006. Linking clinical care to community resources for cardiovascular disease prevention: the North Carolina Enhanced WISEWOMAN project. *J. Womens Health* 15:569–83
58. Jilcott SB, Macon ML, Rosamond WD, Garcia BA, Jenkins LK, et al. 2004. Implementing the WISEWOMAN program in local health departments: staff attitudes, beliefs, and perceived barriers. *J. Womens Health* 13:598–606
59. Joronen K, Rankin SH, Astedt-Kurki P. 2008. School-based drama interventions in health promotion for children and adolescents: systematic review. *J. Adv. Nurs.* 63:116–31
60. Kerner J, Rimer B, Emmons K. 2005. Introduction to the special section on dissemination: dissemination research and research dissemination: How can we close the gap? *Health Psychol.* 24:443–46
61. Keyserling TC, Samuel Hodge CD, Jilcott SB, Johnston LF, Garcia BA, et al. 2008. Randomized trial of a clinic-based, community-supported, lifestyle intervention to improve physical activity and diet: the North Carolina enhanced WISEWOMAN project. *Prev. Med.* 46:499–510
62. Kok G, Gottlieb NH, Commers M, Smerecnik C. 2008. The ecological approach in health promotion programs: a decade later. *Am. J. Health Promot.* 22:437–42
63. Legler J, Meissner HI, Coyne C, Breen N, Chollette V, Rimer BK. 2002. The effectiveness of interventions to promote mammography among women with historically lower rates of screening. *Cancer Epidemiol. Biomark. Prev.* 11:59–71
64. Lewis SD, Johnson VR, Farris RP, Will JC. 2004. Using success stories to share knowledge and lessons learned in health promotion. *J. Womens Health* 13:616–24
65. Lopez LM, Tolley EE, Grimes DA, Chen-Mok M. 2009. Theory-based interventions for contraception. *Cochrane Database Syst. Rev.* Jan. 21:CD007249
66. Lustria ML, Cortese J, Noar SM, Glueckauf RL. 2009. Computer-tailored health interventions delivered over the Web: review and analysis of key components. *Patient Educ. Couns.* 74:156–73
67. Marcus BH, Bock BC, Pinto BM, Forsyth LH, Roberts MB, Traficante RM. 1998. Efficacy of an individualized, motivationally-tailored physical activity intervention. *Ann. Behav. Med.* 20:174–80
68. Marlatt AG, Gordon JR. 1985. *Relapse Prevention: Maintenance Strategies in the Treatment of Addictive Behaviors*. New York: Guilford
69. Marsh KL, Johnson BT, Carey MP. 2001. Conducting meta-analyses of HIV prevention literatures from a theory-testing perspective. *Eval. Health Profess.* 24:255–76
70. McAlister AL, Perry CL, Parcel GS. 2008. How individuals, environments and health behaviors interact: social cognitive theory. See Ref. 39, pp. 167–88
71. McLeroy KR, Bibeau D, Steckler A, Glanz K. 1988. An ecological perspective on health promotion programs. *Health Educ. Q.* 15:351–77

71. Classic article proposing an ecological model for health promotion which focuses attention on targeting both individual and social environmental factors.

72. Meister JS, Guernsey de Zapien J. 2005. Bringing health policy issues front and center in the community: expanding the role of community health coalitions. *Prev. Chronic Dis.* 2:A16
73. Merzel C, D'Afflitti J. 2003. Reconsidering community-based health promotion: promise, performance, and potential. *Am. J. Public Health* 93:557–74
74. Mobley LR, Root ED, Finkelstein EA, Khavjou O, Farris RP, Will JC. 2006. Environment, obesity, and cardiovascular disease risk in low-income women. *Am. J. Prev. Med.* 30:327–32
75. Mokdad AH, Marks JS, Stroup DF, Gerberding JL. 2004. Actual causes of death in the United States, 2000. *JAMA* 291(19):1238–45
76. Noar SM. 2005. A health educator's guide to theories of health behavior. *Int. W. Community Health Educ.* 24:75–92
77. Noar SM. 2008. Behavioral interventions to reduce HIV-related sexual risk behavior: review and synthesis of meta-analytic evidence. *AIDS Behav.* 12:335–53
78. Noar SM, Benac CN, Harris MS. 2007. Does tailoring matter? Meta-analytic review of tailored print health behavior change interventions. *Psychol. Bull.* 133:673–93
79. Noar SM, Black HG, Pierce LB. 2009. Efficacy of computer technology-based HIV prevention interventions: a meta-analysis. *AIDS* 23:107–15
80. Noar SM, Chabot M, Zimmerman RS. 2008. Applying health behavior theory to multiple behavior change: considerations and approaches. *Prev. Med.* 46:275–80
81. Noar SM, Palmgreen P, Chabot M, Dobransky N, Zimmerman RS. 2009. A 10-year systematic review of HIV/AIDS mass communication campaigns: Have we made progress? *J. Health Commun.* 14:15–42
82. Noar SM, Zimmerman RS. 2005. Health behavior theory and cumulative knowledge regarding health behaviors: Are we moving in the right direction? *Health Educ. Res.* 20:275–90
83. Oldenburg BF, Sallis JF, French ML, Owen N. 1999. Health promotion research and the diffusion and institutionalization of interventions. *Health. Educ. Res.* 14:121–30
84. Painter JE, Borba CP, Hynes M, Mays D, Glanz K. 2008. The use of theory in health behavior research from 2000 to 2005: a systematic review. *Ann. Behav. Med.* 35:358–62
85. Pearson TA. 2007. The prevention of cardiovascular disease: Have we really made progress? A balance of community and medical approaches holds the most promise for preventing CVD. *Health Aff.* 26:49–60
86. Prochaska JM, Prochaska JO, Levesque DA. 2001. A transtheoretical approach to changing organizations. *Adm. Policy Ment. Health* 28:247–61
87. Prochaska JO, Redding CA, Evers KE. 2008. The transtheoretical model and stages of change. See Ref. 39, pp. 97–121
88. Raphael D. 2006. Social determinants of health: present status, unanswered questions and future directions. *Int. J. Health Serv.* 36:651–77
89. Rejeski WJ, Brawley LR, McAuley E, Rapp S. 2000. An examination of theory and behavior change in randomized clinical trials. *Controll. Clin. Trials* 21:S164–70
90. Rimer BK, Glanz K, Rasband G. 2001. Searching for evidence about health education and health behavior interventions. *Health Educ. Behav.* 28:231–48
91. Rohrbach LA, Grana R, Sussman S, Valente TW. 2006. Type II translation: transporting prevention interventions from research to real-world settings. *Eval. Health Prof.* 29:302–33
92. Rosamond WD, Ammerman AS, Holliday JL, Tawney KW, Hunt KJ, et al. 2000. Cardiovascular disease risk factor intervention in low-income women: the North Carolina WISEWOMAN project. *Prev. Med.* 31:370–79
93. Rosenstock IM. 1974. The health belief model and preventive health behavior. *Health Educ. Monogr.* 2(4):354–86
94. Rosenstock IM. 1990. The past, present, and future of health education. See Ref. 32, pp. 405–20
95. Rosenstock IM, Strecher VJ, Becker MH. 1988. Social learning theory and the health belief model. *Health Educ. Q.* 15(2):175–83
96. Rothwell PM. 2005. External validity of randomized controlled trials: To whom do the results of this trial apply? *Lancet* 365:82–93
97. Roussos ST, Fawcett SB. 2000. A review of collaborative partnerships as a strategy for improving community health. *Annu. Rev. Public Health* 21:369–402

78. Meta-analytic review of tailored print health behavior interventions that also examines the use of theoretical concepts associated with positive effects.

98. Sabatino SA, Habarta N, Baron RC, Coates RJ, Rimer BK, et al. 2008. Interventions to increase recommendation and delivery of screening for breast, cervical, and colorectal cancers by healthcare providers systematic reviews of provider assessment and feedback and provider incentives. *Am. J. Prev. Med.* 35:S67–74
99. Sallis JF, Glanz K. 2009. Physical activity and food environments: solutions to the obesity epidemic. *Milbank Q.* 87:123–54
100. Sallis JF, Owen N, Fisher EB. 2008. Ecological models of health behavior. See Ref. 39, pp. 464–85
101. Smedley BD, Syme SL, eds. 2000. *Promotion Health: Intervention Strategies from Social and Behavioral Research*. Washington, DC: Natl. Acad. Press
102. Staten LK, Gregory-Mercado KY, Ranger-Moore J, Will JC, Giuliano AR, et al. 2004. Provider counseling, health education, and community health workers: the Arizona WISEWOMAN project. *J. Womens Health* 13:547–56
103. Statewide Health Improv. Program, Minn. Dep. Health. 2009. *Guide to implementing and evaluation interventions: community health boards*. **www.health.state.mn.us/healthreform/ship**
104. Story M, Kaphingst KM, Robinson-O'Brien R, Glanz K. 2008. Creating healthy food and eating environments: policy and environmental approaches. *Annu. Rev. Public Health* 29:253–72
105. Sussman S, Sussman AN. 2001. Praxis in health behavior program development. In *Handbook of Program Development for Health Behavior Research and Practice*, ed. S Sussman, pp. 79–97. Thousand Oaks, CA: Sage
106. Task Force Community Prev. Serv. 2008. Recommendations for client- and provider-directed interventions to increase breast, cervical, and colorectal cancer screening. *Am. J. Prev. Med.* 35:S21–25
107. The WISEWOMAN Workgroup. 1999. Cardiovascular disease prevention for women attending breast and cervical cancer screening programs: the WISEWOMAN projects. *Prev. Med.* 28:496–502
108. Trifiletti LB, Gielen AC, Sleet DA, Hopkins K. 2005. Behavioral and social sciences theories and models: Are they used in unintentional injury prevention research? *Health Educ. Res.* 20:298–307
109. van Ryn M, Heaney CA. 1992. What's the use of theory? *Health Educ. Q.* 19:315–30
110. Viadro CI, Farris RP, Will JC. 2004. The WISEWOMAN projects: lessons learned from three states. *J. Womens Health* 13:529–38
111. Vogt F, Hall S, Hankins M, Marteau TM. 2009. Evaluating three theory-based interventions to increase physicians' recommendations of smoking cessation services. *Health Psychol.* 28:174–82
112. von Elm E, Altman DG, Egger M, Pocock SJ, Gotzsche PC, Vandenbroucke JP. 2007. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *Ann. Intern. Med.* 147:573–77
113. Watt RG. 2002. Emerging theories into the social determinants of health: implications for oral health promotion. *Community Dent. Oral Epidemiol.* 30:241–47
114. Webb OJ, Eves FF. 2007. Promoting stair climbing: effects of message specificity and validation. *Health Educ. Res.* 22:49–57
115. Weinstein ND. 2007. Misleading tests of health behavior theories. *Ann. Behav. Med.* 33:1–10
116. Weinstein ND, Rothman AJ. 2005. Commentary: Revitalizing research on health behavior theories. *Health Educ. Res.* 20:294–97
117. Weinstein ND, Sandman PM, Blalock SJ. 2008. The precaution adoption process model. See Ref. 39, pp. 123–47
118. Will JC, Farris RP, Sanders CG, Stockmyer CK, Finkelstein EA. 2004. Health promotion interventions for disadvantaged women: overview of the WISEWOMAN projects. *J. Womens Health* 13:484–502
119. Will JC, Loo RK. 2008. The WISEWOMAN program: reflection and forecast. *Prev. Chronic Dis.* 5:A56
120. Yancey AK. 2004. Building capacity to prevent and control chronic disease in underserved communities: expanding the wisdom of WISEWOMAN in intervening at the environmental level. *J. Womens Health* 13:644–49
121. Zaza S, Wright-De Aguero LK, Briss PA, Truman BI, Hopkins DP, et al. 2000. Data collection instrument and procedure for systematic reviews in the Guide to Community Preventive Services. Task Force on Community Preventive Services. *Am. J. Prev. Med.* 18:44–74

101. Institute of Medicine report on usefulness of social and behavioral science interventions in developing broad public health interventions.

Annual Review of
Public Health
Volume 31, 2010

Contents

Symposium: Public Health Significance of Genomics and Eco-Genetics

Epidemiology and Biostatistics

Social Environment and Behavior

Health in All Policies—The Finnish Initiative: Background, Principles, and Current Issues
Pekka Puska and Timo Ståhl 315

Health Services

Indexes

Errata

An online log of corrections to *Annual Review of Public Health* articles may be found at http://publhealth.annualreviews.org/